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A Proposal for the Management of Woodland Caribou in Saskatchewan

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A Proposal For The Management of Woodland Caribou in Saskatchewan

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EXECUTIVE SUMMARY

The regulated hunting of woodland caribou in Saskatchewan ended in 1987, pending an assessment of populations province-wide. Bands of caribou were disappearing regionally and declining herd sizes were evident. Woodland caribou continued to decline in Prince Albert National Park as well.

In the boreal forest, the rare western woodland caribou evolved over huge areas at low densities, and averaged 0.02/km². Birth rates are high but the number of calves surviving the first year is low. Adult mortality is high. Habitat fragmentation and predation are major factors affecting woodland caribou population dynamics. The species demonstrate fidelity to seasonal ranges, are highly mobile, and have behavioral attributes which predispose them to the additive mortality factor of hunting. Most jurisdictions harvest woodland caribou at a rate of 2-3% of the total population.

The development of the northern agricultural area and the forest industry produced significant changes to both the landscape and distribution of the big game resources of the province. The northern agricultural areas had been the most productive forest lands, and represented the best moose habitat as well. White-tailed deer moved in as agricultural development moved northward. Woodland caribou were once common to the southern mixed-wood forest. The proliferation of white-tailed deer and moose associated with resource developments are major determinants of wolf populations. Today the southern and northern commercial forests of Saskatchewan contain the best elements of moose and woodland caribou habitat, respectively.

The decline of woodland caribou in Saskatchewan was further attributed to events of the late 60's - early 70's. The pulp industry began operations in the late 60's and the softwood forests proximate to Prince Albert were aggressively harvested pending completion of an extensive road network in the centre of the province. The snowmobile marked another major turning point in human predation on caribou, and predator control ceased in the late 60's as well. The early 70's were marked by excessive harvests (including non-resident hunting), the severe winter of 1971-72, low reproduction in 1972 along with the implementation of a draw moose hunting system which encouraged the purchase of woodland caribou licenses, and finally another bad winter in 1973-74. Woodland caribou populations never recovered.

The Saskatchewan boreal forest is unique and lends itself to ecosystem management. Woodland caribou are the key ungulate species of northern Saskatchewan, and represent a barometer sensitive to environmental change within the northern Commercial Forest and Precambrian Shield.

Proposed changes to resource management in forested Saskatchewan include:

1) a partitioned Commercial Forest whereby less productive northern portions would be managed for woodland caribou and small scale forestry; more productive southerly portions would be intensively managed for moose and wood fibre. Innovative approaches to forestry and wildlife management will be required;

2) abandonment of the provincial moose management strategy for Saskatchewan. The applicability of this program to the northern Commercial Forest and Precambrian Shield is questionable; and

3) standardize government policy on access management associated with resource development. In the forestry sector, silvicultural plans are not integrated into annual and 5 year operating plans. Similarly the operations of the small independents and the large forest harvesting companies lack integration. In both cases roads are kept open unnecessarily and compromise other resource values.

The co-management of woodland caribou with aboriginal people is essential if the species has any chance of survival south of the Shield. Despite the concerns of aboriginal people regarding environmental damage brought about by resource development, the present situation of more moose and deer in the forest may be preferable from a subsistence point of view to the restoration of woodland caribou populations in select areas. It may be that the current unregulated harvest represents the available surplus of woodland caribou province-wide. The management proposal reflects the view of wildlife managers and is intended to stimulate discussion that will ultimately lead to a management document acceptable to all parties concerned.

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1.0 Introduction

The caribou of North America belong to a single species *Rangifer tarandus*; of the four sub-species native to North America, the woodland caribou inhabiting the boreal forest of Saskatchewan are considered to be *Rangifer tarandus caribou*. Kelsall (1984) has determined the western woodland caribou to be rare across its distribution.

There was no sport hunting of woodland caribou between the years 1947 and 1961, inclusive. Regulated hunting resumed in 1962, only to be terminated again in 1987. In both cases season closure was invoked due to perceived low populations of woodland caribou. With the second closure there was a commitment by the province to assess current woodland caribou populations and to derive a provincial management strategy for the species. Specific goal(s) and objectives were thought necessary to effect this management plan.

1.1 Goal

To ensure woodland caribou do not become threatened or endangered in Saskatchewan by effecting a management plan that reflects their role as a key species in the biodiversity of mature forest ecosystems.

1.2 Objectives

- To determine the causative factors of woodland caribou population decline in Saskatchewan.
- To sustain woodland caribou and their habitats at present levels.
- To determine the feasibility of future sport hunting opportunity.

2.0 Woodland Caribou in North America

2.1 Evolution and Density

Woodland caribou evolved at low densities. Survival strategies are predicated upon "getting lost" in huge open areas of contiguous boreal forest habitat. Densities averaging 0.02/km^2 (1/50 km^2) represent the norm across the boreal forest of Canada. In the southern boreal forest, many bands of woodland caribou are artifacts of history due to the fragmentation of habitat.

An overview of caribou studies across North America provides some insight into the plight of boreal forest woodland caribou across its distribution. The large barren-ground caribou herds utilize extensive migrations to minimize the effects of predation by wolves. Alternate ungulate prey species are generally not available and caribou populations are about 0.3/km^2. Mountain caribou migrate altitudinally to lessen the impacts of predation. A spatial separation between caribou and alternate prey, which

generally occupy lower elevations, permits caribou to survive in the presence of both alternate prey and wolves at densities approximating 0.1/km². Boreal forest woodland caribou are generally not migratory (Darby and Pruitt 1984) and have effected an anti-predator strategy based on low numbers spread over entire ecosystems. More recently, however, relatively high numbers of alternate prey species exist because of the conversion of mature forested habitats to early seral stage habitats (logging), and the cumulative effects of the mild winters of the 1980's on the increased survival of moose (*Alces alces*) and white-tailed deer (*Odocoileus virginianus*). Inflated numbers of early seral stage species tends to support increased numbers of wolves (*Canis lupus*) and black bears (*Ursus americanus*); hence woodland caribou populations average about 0.02/km² in the boreal forest. In Ontario, greater numbers of wolves were first observed in caribou country after 1860 when white-tailed deer began to extend their range northward (Bergerud 1974). In British Columbia (during the 1930's and 1940's) moose expanded their ranges into caribou country, an expansion that was similarly accompanied by wolves (Bergerud and Elliot 1985).

2.2 Behaviour

Caribou are creatures of habit and traditionally use some areas more than others despite habitat quality (Rayner and Bennett 1988). Collectively, they are faithful to core areas for calving (Kiell et al. 1986), for rutting (Edmonds 1988), to small areas of habitat (Rominger and Oldemeyer 1989), and seasonal ranges (Farnell and McDonald 1989). The species is predictable and constantly on the move, behavioral attributes which predispose them to hunting related mortality. Caribou, once found, are easily hunted and killed (Shoesmith 1986).

2.3 Habitat

Habitat selection is probably related more to predation considerations year-round and to thermal cover/insect harassment factors during the summer than it is to any of the food requisites. Woodland caribou make extensive year-round use of semi-open to open bogs where forage is abundant. During the spring and summer, boreal forest woodland caribou feed on forbs, deciduous leaves, lichens, grasses and sedges, whereas during the fall-winter period both arboreal and terrestrial lichens, sedges and bog ericoids are utilized (Darby et al. 1989). The water sedge (*Carex aquatilis*) is a valuable early winter forage for caribou (Pegau 1975) and the potential of other sedge species [eg. the awned sedge (*C. atherodes*), beaked sedge (*C. rostrata*) and prostrate sedge (*C. chordorrhiza*)] as forage cannot be ruled out (Campbell et al. 1974). If food does become a limiting factor, it is generally during the late winter when unfavourable snow conditions force woodland caribou out of lowland habitats onto upland jack pine (*Pinus banksiana*) sites where high energy terrestrial lichen species become dietary staples. Preferred lichens are the genera *Cladina, Cetraria* and to a lesser extent *Cladonia* (Don Thomas, personal communication). Historically it would appear that late winter habitat, although important, was over-emphasized at the expense of other considerations such as predation.

Caribou are able to sustain themselves on lower quality habitats in the absence of wolves (Bergerud 1984). Caribou habitats are generally the " unproductive" lands of the commercial forest; that is, bogs, fens and understocked jack pine sites on thin infertile soils. Any stands of commercial value on woodland caribou range tend to be lowland black spruce (*Picea mariana*) sites and moderately stocked upland jack pine sites. The most productive forest soils are along the southern boreal forest which are also the productive moose and white-tailed deer areas.

Barren-ground caribou migrations are deflected by fires exceeding 10,000 ha (Thomas 1985). In areas

where fires have been much smaller, Bergerud (1983) contends that caribou actually prefer to winter in mid-age (40 years post fire) seral stage habitats. "If it is accepted that fires are part of boreal forest ecosystems, then it follows that the vegetation has never existed in a climax state over wide areas.....The carrying capacity of the land may well be similar to what it always has been (Johnson and Rowe 1975)". Fire may be essential to rehabilitate caribou habitat.

Traditionally thermal cover has been an important consideration for the over-winter survival of big game. For woodland caribou, however, the summer period would appear to be the most critical in terms of thermal cover requirements and tends to be overlooked. Lowland black spruce with an understorey of sphagnum and/or feather moss tend to be cool sites and harbour relatively few insects. Similarly, sparsely vegetated areas are also devoid of insects.

2.4 Home Range

The home ranges of woodland caribou are highly variable. They vary annually, seasonally, and between the sexes since males and females remain segregated for most of the year. Collectively, annual home ranges average about 250 km^2. However, habitat use can change considerably from year to year and the greater the numbers of animals involved over time, the more disparate home range size becomes.

Highly variable annual and seasonal home ranges for woodland caribou populations are evident in studies conducted in Manitoba and Alberta. Annual ranges varied between 539 and 1196 km^2 for females and males respectively, in northeast Alberta (Fuller and Keith 1981). Summer ranges varied from 22 to 586 km^2 in two other areas of Alberta; the winter ranges varied between 320 and 1470 km^2 (Edmonds and Bloomfield 1984, Edmonds 1988). Summer ranges are much smaller than the winter ranges. Whether woodland caribou migrate is open to interpretation. Portions of herds may migrate (Bergerud 1967, Craighead and Craighead 1987, Edmonds 1988) but boreal forest caribou utilize such huge home ranges (up to 2400 km^2) that movement patterns could be construed as migratory.

2.5 Productivity

Woodland caribou breed for the first time at 2.5 years of age (Darby et al. 1989, Fuller and Keith 1981) and rarely produce twins (Bergerud 1964). The rut occurs between mid-September and mid-October (Shoesmith and Storey 1977), with the calves born between mid-May and early June (Fuller and Keith 1981), after a 7.5 month gestation. Nutritional stress has not been shown to affect reproductive performance (Bergerud 1967) and pregnancy rates of 90-95% are common. Pregnancy rates for mainland Canadian herds average 86% (Bergerud and Elliott 1986). Recruitment (the number of individuals entering the population at 1 year of age) however, is low.

2.6 Mortality

Caribou calves, which at birth comprise between 27 and 30% of most populations (Darby et al. 1989) generally make up 10-16% (average 12.4) of herds by late winter (Bergerud 1974). Recent studies of some barren-ground caribou herds have documented about a 20% calf loss in the first 24 hours of life (Whitten et al. 1992). By the end of the second month, only 42% of the calves are alive (Fuller and Keith 1981). Adults sustain large losses also. Annual adult mortality rates between 21 and 28% have been recorded in the literature (Edmonds 1988, Edmonds and Bloomfield 1984, Seip 1990). Annual natural (not predation related) mortality rates are in the order of 6% (Bergerud 1967), with social inter-actions

inter-actions associated with the rut being a primary cause of death in stags, and calving problems being the major factor in female mortality. Mortality rates appear to increase southward, with bears and wolves strongly implicated.

Despite innumerable studies on caribou-wolf relationships, the degree to which wolves impact on caribou populations remains open to interpretation (Van Ballenberghe 1985, 1989; Bergerud and Ballard 1988, 1989). Extenuating circumstances inevitably confound predator-prey studies to the point where actual predation rates are difficult to assess. Nevertheless, predators clearly interact in an additive or compensatory way with other regulatory factors such as hunting mortality, climatic extremes and food limitations in their degree of influence on caribou populations (Klein 1991). Caribou populations have grown rapidly in the absence of predators and hunting (Darby et al. 1989). Bergerud et al. (1983) and Skoglund (1986) reported caribou and reindeer populations of 18 and 40/km^2, respectively, in the absence of predators. In the Yukon, removal of wolves resulted in an increased calf recruitment from 9 to 22%, and adult caribou survival increased by 60% (Hayes et al. 1989). Wolf reductions from 10 to between 1 and 4/1000 km^2 resulted in a 6% rate of growth in a caribou herd in British Columbia, whereas two herds allowed to co-exist with wolves sustained 55% calf mortality in the first 2 weeks of life (Bergerud and Elliot 1986). The Avalon herds of wolf-free Newfoundland are six times more dense than maximum densities of caribou herds co-existing with wolves across North America (Bergerud et al. 1983).

2.7 Role of Hunting

With the advent of modern hunting, the critical balance between recruitment and mortality was upset and populations began to decline (Bergerud 1974). The decline of some herds has been attributed solely to legal hunting (Bergerud 1967).

Since hunting is an additive mortality factor in caribou population dynamics, restrictions on harvest are essential, particularly if wolf populations remain uncontrolled. Most caribou populations in North America that co-exist with wolves go into decline once harvests by humans exceeds 5% (Bergerud 1974). In the Yukon, 2% harvest levels are recommended for either-sex hunting seasons (Farnell and McDonald 1989). In British Columbia where bulls only hunting is permitted, the quality of bulls in local herds began to deteriorate once harvest levels exceeded 3% (Daryll Hebert, personal communication).

2.8 Linear Developments

The term linear developments pertains to roads, transmission lines, hydroelectric projects, and the like. These types of developments impact on caribou by cutting off access between seasonal ranges, and have the potential to eliminate migration altogether. Roads in particular have been termed the greatest threat to caribou (Bergerud 1979) and the most important part of any resource development (Kiell et al. 1986).

Major mortality in caribou populations have been indirectly attributable to increased road access (Johnson 1985, Edmonds 1988). Roads lead to increased poaching (Edmonds 1986), and eventual herd decline through over-hunting (Farnell and McDonald 1989). In Alaska the harvest of barren-ground caribou was greatly influenced by the proximity of herds to highways (Rausch 1969). Along with predation, the presence of roads leading to increased harvest of woodland caribou by hunters are the chief causes of mortality in the Yukon (Farnell and McDonald 1988).

Hydroelectric developments have had temporary negative impacts on woodland caribou (Kiell et al. 1986). Animal numbers change between development and post development phases but

productivity-age structure indices remain unchanged. Behavioral responses to newly created linear features are well documented but actual population responses are not (Klein 1991). Recent monitoring of resource developments in Newfoundland has shown that male caribou are actually attracted to development activities whereas females with calves avoid same (Rick Bonar, personal communication).

The reaction of migrating caribou to pipelines has been studied at length in Alaska. This type of development had minimal impact on caribou, with most animals crossing the pipelines at the point of encounter (Carruthers and Jakimchuk 1987).

2.9 Diseases and Parasites

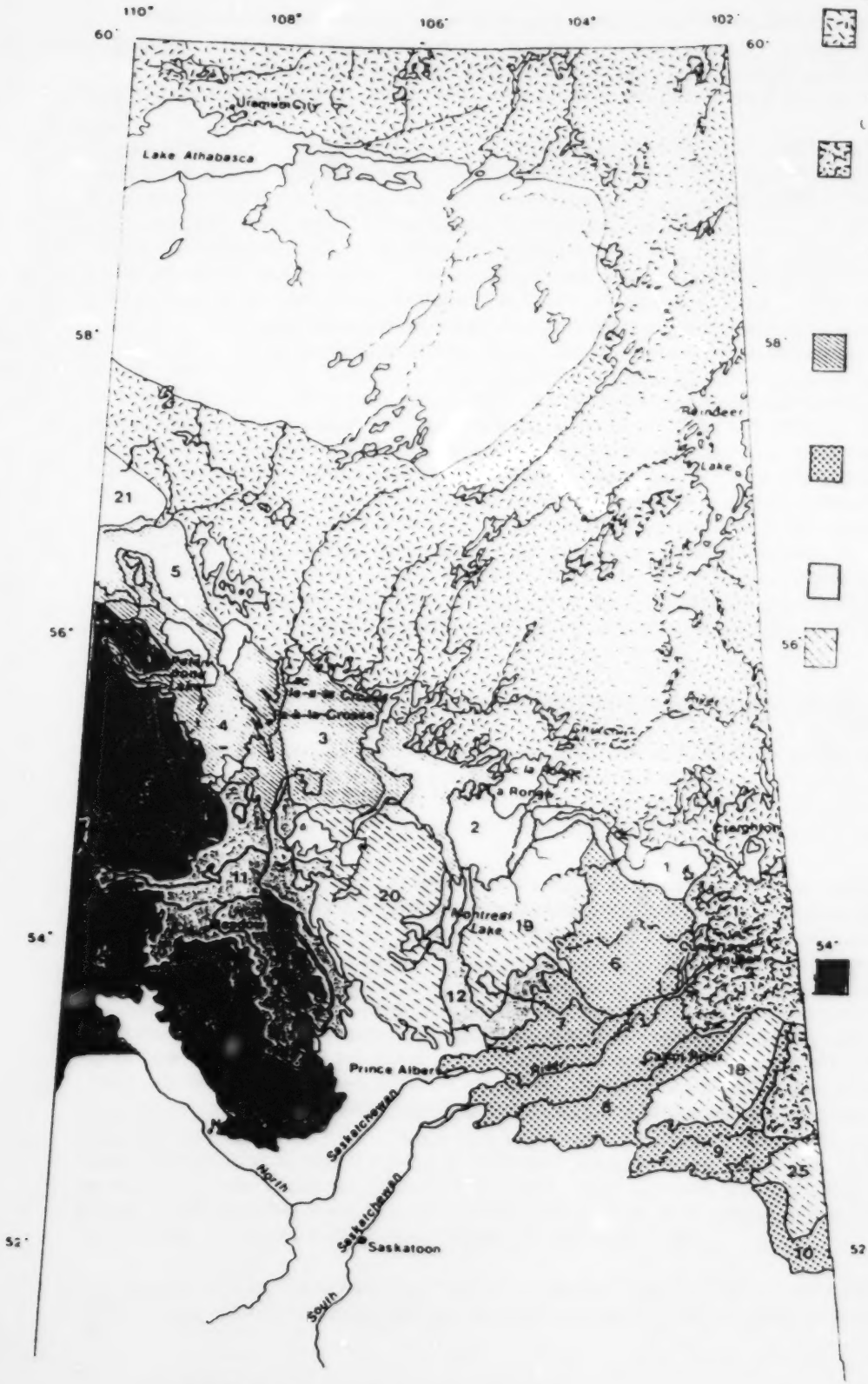
Trottier (1988b) provided an excellent review of the diseases and parasites affecting caribou. Necrobacillosis and brucellosis have been documented in caribou, with brucellosis (*Brucella suis* [biotype 4]) diagnosed among barren-ground caribou wintering in Saskatchewan (Wobeser 1985). Besnoitiosis has been diagnosed in Saskatchewan woodland caribou (Wobeser 1976). Blackflies, mosquitos, warble flies, bot flies, horseflies and deerflies are the common ectoparasites of woodland caribou. These ectoparasites rarely result in death but do predispose the animal to other forms of mortality. Although warble flies have not been documented in Saskatchewan woodland caribou, Kelsall (1984) reports that woodland caribou tend to harbour more warble fly larvae than barren-ground caribou, with younger animals and older males being particularly vulnerable (Kelsall 1984). The moose tick (*Dermacentor albipictus*), potentially fatal to moose, has been documented at high infestation levels on woodland caribou in Saskatchewan (Nemeth 1987). The meningeal worm (*Parelaphostrongylus tenuis*), fatal to woodland caribou (Hoff et al. 1970), has yet to be diagnosed in Saskatchewan woodland caribou. The white-tailed deer plays a large role in the life cycle of the meningeal worm.

3.0 Distribution and Historical Events Affecting Woodland Caribou in Saskatchewan

3.1 Distribution

In 1914, woodland caribou ranged as far south as the Duck Mountains (52 degrees latitude). In forested Saskatchewan, woodland caribou are not found in the subarctic boreal ecoregion (Rowe 1972) of extreme northeast Saskatchewan, but occur in low numbers in the more fire prone Athabasca Sandstone Formation south of Lake Athabasca (Fig. 1).

Woodland caribou are found in the Great Plains and Central Lowlands Provinces of the Interior Plains, and on the Canadian Shield Province (Acton et al. 1960). The southern extremities of their distribution include the Alberta High Plains and the Manitoba Lowlands (Fig. 1). In Central Saskatchewan, woodland caribou are found on the Saskatchewan Plain Region, principally on the Upper Churchill Lowlands. Most of the woodland caribou in Saskatchewan are found on the Precambrian Shield.



PHYSIOGRAPHIC REGION

CANADIAN SHIELD PROVINCE

Rock Knob Complex rock knob and basin terrain

Athabasca Plains Region rolling ter sand plains dunes moraine sandy t and bedrock

CENTRAL LOWLANDS PROVINCE

Manitoba Lowlands Region mainly lacustrine plains associated with Lake Elevation under 1,000 feet above sea le

1 Namew Lake Lowland
2 Cumberland Lake Lowland
3 Red Deer Lowland

Saskatchewan Plains Region elevat from 1,000 to over 2,400 feet above sea extensive areas of lacustrine deposits a water worked till, till plains and morai

Upper Churchill Lowlands
1 Deschambault Limestone Lowland
2 Lac La Ronge Lowland
3 Lac La Plonge Lowland
4 Ile-a-la Crosse Lowland
5 Methy Portage Lowland

Saskatchewan River Lowlands
6 Mossy River Lowland
7 White Fox Plain
8 Carrot River Plain
9 Upper Red Deer Plain
10 Swan River Plain

Central Saskatchewan Plains
11 Beaver River Plains
12 Wapawekka Border Plain

The Uplands
18 Pasquia Hills
19 Wapawekka Upland
20 Waskesiu Upland
21 Firebag Upland
25 Porcupine Hills

THE GREAT PLAINS PROVINCE

Alberta Plateau Region mainly o 2,000 feet above sea level; the region separated from the Central Lowland Province by the Coteau du Missouri an eastward facing broken escarpm Uplands within the region include bo dissected plateaus and rolling mora hills. Between these are extensive and lacustrine plains

Uplands
1 The Missouri Coteau
5 Thickwood Hills
6 Muskeg Hills

Figure 1. Physiographic Regions of Saskatchewan

3.2 Forest Ecology

The boreal forest of Saskatchewan is a fire-dependent ecosystem, and as such is characterized by few tree species. Major species are trembling aspen (*Populus tremuloides*), balsam poplar (*P. balsamifera*), white birch (*Betula papyrifera*), jack pine, black spruce, white spruce (*Picea glauca*) and larch (*Larix laricina*).

3.3 Fire History

In general terms, the fire frequency of the 20th century has exceeded that of the previous two centuries when colder climates prevailed. The early 1900's were years of very high fire hazard and destructive fires were commonplace. The years 1911, 1913, 1919, 1923, 1929, 1936 and 1937 were particularly bad fire years. In 1919, fires of several townships consumed the Bear Hills, and the Nisbet Forest proximate to Prince Albert. The area burned in the 1930's (178,000 ha) was about twice that of the 1940's and more than three times that of the 1950's. A summary of the worst fire years of the past four decades is presented in Table 1.

Table 1. Average fire size and frequency of large forest fires in Saskatchewan, selected years.

	Average Fire Size (ha)	Number of Fires (ha)		
		>260	>10,000	>100,000
1955	28,146	21	6	1
1961	10,625	73	10	1
1964	9,898	47	11	-
1970	14,205	43	2	1
1978	10,126	9	3	-
1980	11,062	82	17	-
1981	18,012	122	40	4

3.4 Cutover History

The railroad reached Prince Albert in 1890 and with settlement came a requirement for wood products. By 1900, both the Prince Albert Lumber Company and the Saskatchewan Logging Company were logging in the Prince Albert area north towards the future site of the National Park (Tarlton 1985). The Pas Lumber Company similarly began operations about this time in the northeast portion of the province. Logging intensified in the late 1930's as farmers from drought stricken southern Saskatchewan re-settled along the agricultural "fringe". Wood extraction was generally a highgrading process, as the best forest soils were also the best agricultural soils. Pure white spruce stands or mixed wood stands with significant components of white spruce were often the areas targeted for forest/agricultural development.

A significant dimension was added to the forest industry in the mid 1960's with the arrival in Prince Albert of the first provincial pulp mill. Although large scale post operations were already in existence, the impact of the pulp industry was far more significant in terms of woodland caribou habitat. In 1971, the mill was harvesting equal mixtures of jack pine and black spruce. By 1974, utilization of softwood stands close to the mill was so intense that harvest exceeded the annual allowable cut by 70% around Prince Albert National Park (Shultz International Consultants 1975).

During the next 10 years the utilization of softwoods abated and by the mid 1980's more of the mills requirements were coming from hardwood stocks. At the present time the mill has a 30 year supply of overmature wood and is cutting at 60% of the annual allowable cut. About 4.8% of the Weyerhaeuser productive land base is comprised of forest stands older than 120 years.

Prior to 1973, clearcut size was industry imposed. In 1973, the 40 ha/50% rule was established by mutual consent between the company and the province. At least half of each operating area had to remain for a second cutover. By 1981, clearcut size had increased to 120 ha in mixed wood stands but remained at 40 ha for softwood stands.

3.5 Transportation

In the earliest decades of the twentieth century, most communities in northern Saskatchewan were supplied by "trains" that utilized a system of province-wide winter ice roads. Horse trains from Prince Albert supplied the Reindeer Lake area up to the late 1920's at which time tractor trains came into widespread use as a means of supplying the north (Keighley 1988). As vehicular traffic became more commonplace, a transportation network developed across the north that, by today's standards, would be classified as trails. The first major highway that accessed northern Saskatchewan was built in 1939 between Prince Albert and La Ronge. The development of northern Saskatchewan began in the late 50's-early 60's with the Roads to Resources Program of the Diefenbaker administration. By 1962, the Hanson Lake road was completed between Smeaton and Creighton. With the advent of the pulp mill in 1966, unprecedented road development took place in the centre of the province. Whereas there was the equivalent of 351 and 307 km of primary and secondary (forest industry standards) roads prior to the mill, by 1980 an additional 286 and 344 km of roads had been built, effectively doubling the road network in Game Management Zone (GMZ) 28 (Fig. 2). This increase in haul road development was accompanied by the construction of an additional 4,165 km of improved bush roads in that zone.

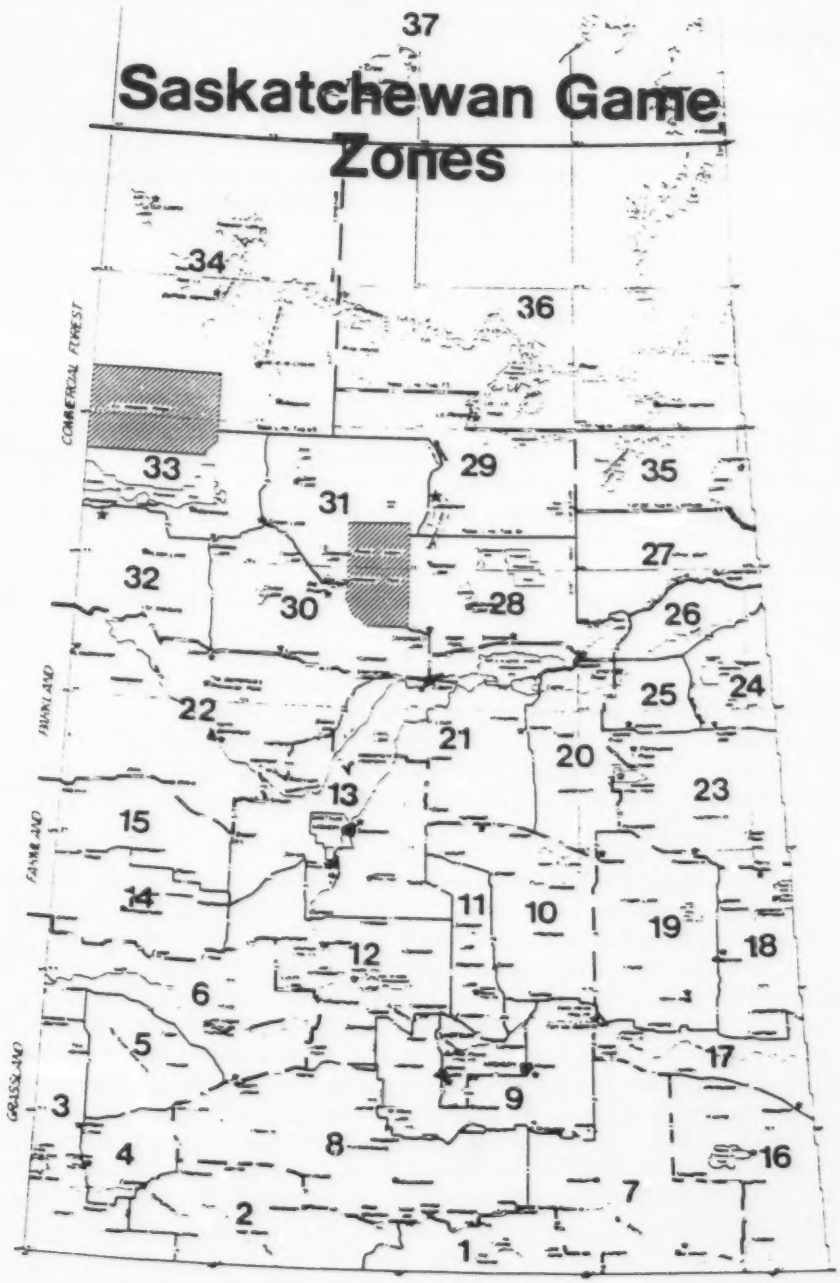


Figure 2. Saskatchewan Game Management Zones (1964-1974).

4.0 Relationship of Woodland Caribou to Other Ungulates

Mule deer (*Odocoileus hemonius)* were always in the Aspen Parklands and forested areas of Saskatchewan. White-tailed deer were first observed in the Parklands after 1900 and by 1920 had reached The Pas, Manitoba. In five years the white-tailed deer replaced the mule deer as the most common deer at The Pas (Bird 1961). Keighley (1988) speaks of "jumping deer" in the Montreal Lake area in 1920, with deer (no species mentioned) regularly seen along both the Cowan and Churchill Rivers, and in the Tippo Lake area during the 1924-1925 period (Karras 1975). About 1932, white-tailed deer were documented east of Cree Lake, and by 1938 had reached the Bronson Forest of northwest Saskatchewan (Rock 1980). Today, white-tailed deer occur throughout the province and are common in forested areas south of the Shield.

Historically, moose were indigenous to the Aspen Parkland (Bird 1961). Whillans (1955), in his accounts of the Kelsey expeditions of 1690-91, talks of moose along the Saskatchewan Rivers. In 1885, moose were common in the area that is now Prince Albert National Park. An analysis of moose populations during the 1900's reveals highly variable numbers of the species both in geographic and temporal terms. The first moose observed in the Pelican Narrows area was in 1910 (department files). Moose were plentiful in the Star City, Whitefox and Peesane districts of Saskatchewan between 1911-1915 and large harvests of moose were recorded in 1919 and 1920, and again 10 years later during the 1929 and 1930 hunting seasons (Fig. 3). Record high moose populations also occurred in the Neeb District of northwest Saskatchewan in 1930, followed by the first wolves and bears to the region later in the decade (department files). High moose populations within Prince Albert National Park, and to the east, in the 1938-1942 period was accompanied by correspondingly low numbers of the species along the Smoothstone River and the area east and north of Montreal Lake. Although moose were plentiful in an area termed the "Warehouse" 65 miles east of Nipawin in 1944, moose populations crashed province-wide between 1945-1947. Abnormally heavy snowfalls during the winters of 1948-1949 and 1955-56 (Bird 1961) slowed the recovery of provincial moose populations. In 1956, Karras (1975) states the entire country seemed devoid of game.

The relationship between woodland caribou and moose harvest changed markedly after World War 2 (Fig. 3). Although there are problems with harvest data, harvest levels over a 75 year period would be indicative of the relative abundance of each species in each of the decades. There were no harvest data for the period 1942-1945 inclusive, but by 1946 the harvest of woodland caribou and moose had declined to two and 256, respectively. Wolf control measures were enacted at this time and remained in place after moose and woodland caribou seasons were re-opened in 1953 and 1962, respectively. Prior to the war, it would appear that there were more woodland caribou relative to moose. This period corresponded with the settlement of the northern agricultural area, and the reported harvest of woodland caribou must have occurred in the southern commercial forest, as there were almost no roads in northern Saskatchewan at that time. The whole relationship changed during the early 1960's, a period coincident with the development of an intensive forest industry. Moose populations expanded rapidly at this time. Resource developments, including agriculture, have pushed the "prime" woodland caribou and moose production areas northward.

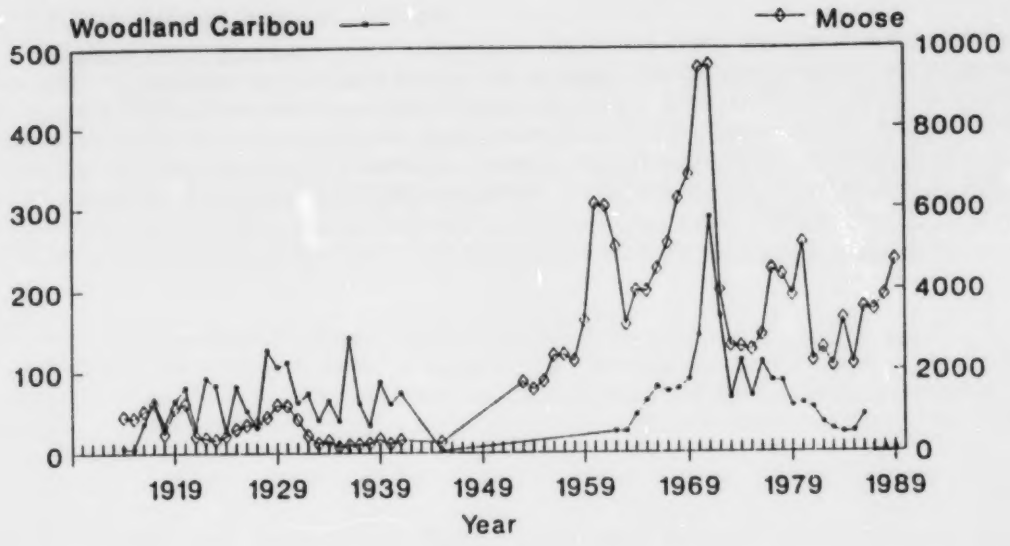


Figure 3. The historical relationship between woodland caribou harvest and moose harvest in Saskatchewan.

5.0 Status of Woodland Caribou Populations in Saskatchewan

During the 1920's and 1930's, groups of 15-25 woodland caribou were commonly seen in forested Saskatchewan (Trottier 1988b). Populations of woodland caribou were thought to be increasing, whereas elsewhere in North America populations were in decline (Public Archives of Canada).

In 1937, Saskatchewan afforded the best opportunity in Canada of obtaining enough stocks of woodland caribou to supplement the last caribou herd in the mainland boreal United States. The two areas of Saskatchewan being considered for the source of woodland caribou to the state of Minnesota were the area west of The Pas and Montreal Lake north. Animals were taken from the Montreal Lake area and transported to Minnesota, but the transplant was unsuccessful.

5.1 Province of Saskatchewan

Population declines of woodland caribou evident within Prince Albert National Park during the mid 1940's also took place outside the Park. A harvest of only two woodland caribou during the 1946 hunting season was a major factor in the closure of regulated hunting on the species the following year.

Sightings of woodland caribou began to increase again on moose surveys conducted in the late 1950's. Ruttan (1960) estimated 92 woodland caribou to be on a 700 km^2 area west of Sled Lake during the winter of 1959-60 (13.1 caribou/100 km^2). An apparent increasing woodland caribou population was attributed to the wolf control operations of the 1950's and to the prohibition on hunting.
Regulated hunting resumed in portions of the north in 1961; the following year, no area restrictions were in place. The Sled-Dore, Clarke Lakes and Cumberland south areas, believed to have supported above

average populations in the late 1950's-early 1960's (Maliepaard 1961), were reduced to scattered individuals by the time sport hunting was closed for the second time after the 1986 season. The relationship of woodland caribou harvest in the Dore-Clarke Lakes area to the provincial harvest is presented in Fig.4. The significant proportion of the provincial woodland caribou harvest coming out of GMZ 32 (Fig. 2) ultimately led to population reductions in the area. An aerial survey of Ruttan's former study area in 1987 turned up only 11 woodland caribou or a reduced density of 3.8 woodland caribou/100 km² (department files).

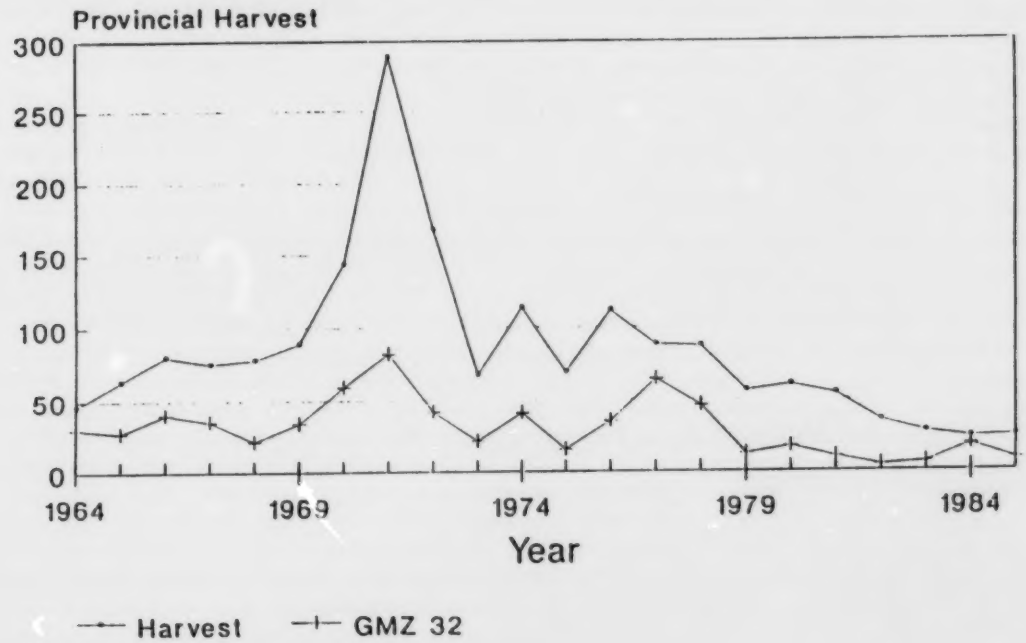


Figure 4. Provincial/regional harvest of woodland caribou. 1964-1985.

Trottier (1988) compiled the most complete survey of woodland caribou in the province to date. Through a process of interviews and sighting forms, the provincial distribution of woodland caribou was recorded for the 1960-1987 period. The majority of herds were in the La Ronge (73) and Prince Albert (27) Saskatchewan Natural Resources administrative regions; fewer herds were documented in Hudson Bay region. Survey results were not reliable in Meadow Lake region, particularly along the west side of the Shield.

Provincially, and on a regional basis, there have been marked declines in the average size of woodland caribou herds between the 1970's and the 1980's (Trottier 1986). Provincially, average herd size has declined from 6.1 (sample size N=311) to 4.6 (N=1263) between the 1970's and 1980's, respectively. Regionally, herds in Prince Albert region declined from 6.7 to 3.4 for the comparable period.

In La Ronge region, there was no reduction in herd size. Woodland caribou herds have persisted in the Weyakwin-Montreal Lake area north to Emmaline Lake in Prince Albert region, and herds have consistently been seen in the La Ronge-Nemeiben-Besnard Lakes areas as well as in the Pelican Narrows-Mari Lakes area of eastern La Ronge Region. Today, it is rare to see woodland caribou south of 53 degrees latitude.

5.2 Prince Albert National Park

Prince Albert National Park was created in 1927. In the winter of 1939-1940, a census of woodland caribou in the Park indicated an over-wintering population of 600-700 animals (Soper 1951). Warden reports alluded to woodland caribou moving into the Park in the early winter period but not being there the remainder of the year. By 1946, the Park population was in decline, attributable to recent fires in northern portions of the Park, over-hunting outside the Park and increasing numbers of timber wolves throughout the area. Banfield (1951), after reviewing Soper's data, down-graded the previous woodland caribou population estimate in the Park to 200 animals and estimated the 1951 population to be 50 head.

There was little in the way of woodland caribou inventory in the Park over the next 25 years. In the winter of 1970-71 warden reports further lowered the Park population to 24 animals, but consecutive surveys in 1977 and 1978 produced estimates of 37 and 26 woodland caribou in or near the Park (Burles et al. 1978). In 1990, an early December aerial survey turned up no woodland caribou in the Park but groups of animals off the northeast and northwest corners (Fitzsimmons 1991).

5.3 Remnant and Extirpated Saskatchewan Woodland Caribou Herds

Remnant herds exist in discontinuous but suitable areas of habitat, isolated by past and present logging practices or by extensive road networks. Such herds can be found on the top of the Wapawekka and Pasquia Hills, the Suggi Lake-Cumberland area, along the Missipuskiow River, southeast of Candle Lake, the White Gull Lake area, the "Bacon Bog" north of Shipman, the Sled Lake area and the small herds in the vicinity of Kazan Lake east to Lac Ile-a-la-Crosse. The status of a band utilizing the islands of Lac la Ronge is unknown because of its juxtaposition to small band(s) of woodland caribou inhabiting the Nemeiben-Egg Lake area.

Some herds have been relegated to almost individual animal status or have completely disappeared. Woodland caribou have all but disappeared in The Pas area. After the Hanson Lake Road was completed in 1962, hunters sat at known crossing points along the highway and local herds were eliminated at Miles 64, 78 and 104 (department files), and close to Creighton (Trottier 1988a). In 1981, upgrading of a winter road to highway status opened up the area between Beauval and Besnard Lake. Within a few years the large herds resident to this area were significantly reduced by both regulated and unregulated hunting. (Rick Shussel, personal communication, Trottier 1988a). Near Kazan Lake, heavy hunting pressure during the early 1970's and continued unregulated hunting through the 1980's have reduced a once large herd to a few scattered individuals. The Canoe Lake herd, associated with the Keeley Flats, has similarly all but disappeared.

5.4 Role of Unregulated Hunting

The role of regulated hunting in the demise of some woodland caribou herds has been well documented. Also, it was common for wildlife managers of the day to use woodland caribou as bait in the wolf campaigns of the 1950's and 1960's. The role of unregulated hunting in woodland caribou population decline is less clear. Trottier (1986) speculates that unregulated hunting may have eliminated entire bands from some areas of the province. Trottier (1988b) further relates unregulated hunting activities to both forestry operations and to increased access. Harvests of woodland caribou have taken place during the commercial fishing season (department files). At one time, woodland caribou were shot by trappers for dog meat and were dietary staples for prospectors, miners and settlers to the north,

including farmers and loggers.

The preference of aboriginal people for caribou meat relative to moose and deer is not clear. Ruttan (1960) stated caribou were preferred as they were easier to hunt but Trottier (1988b) refutes this by stating a definite preference by native peoples for moose and deer. Preferences, however, may not reflect reality. In the Molonosa area, local residents switched from woodland caribou to moose when the latter were plentiful during the 1960's but switched back to woodland caribou after a combination over-harvest and severe winters of the early 1970's decimated moose herds in the area (Wayne Runge, personal communication).

Woodland caribou continue to be taken opportunistically (Trottier 1988a) in conjunction with moose hunting, commercial fishing and trapping related activities. In the northwest portion of the province, unregulated moose hunters gravitate towards the Air Weapons Range (Randy Seguin, personal communication), and woodland caribou have been taken during these hunts. The increased use of snowmobiles by aboriginal people and trappers since the late 1960's has exposed many previously inaccessible woodland caribou bands to harvest by humans. The snowmobile represented a major turning point in human predation as caribou had been relatively safe in the large remote open bogs where few people ever trapped or travelled.

5.5 Analysis of the Woodland Caribou Harvest Data

The regulated harvest of woodland caribou was high throughout the 1920's. Harvests in the 1928-1936 era approximated that of the late 1960's-early 1970's (excluding the record 1971 harvest)(Fig. 3). Between 1928 and 1930 the harvest was 106-126 animals; in 1936, 141 woodland caribou were shot (DNR annual reports). The harvest of woodland caribou in 1970 was 143, with harvests of 113 and 111 occurring in 1974 and 1976 , respectively. The earlier harvests would have taken place along the forest-agricultural interface whereas subsequent harvests of woodland caribou during the 1970's took place across all of forested Saskatchewan after the road network associated with timber extraction was in place. Whereas the harvest of moose has peaked at the beginning of each decade regardless of harvest strategy, the harvest of woodland caribou steadily declined after the record 1971 harvest. This record harvest of caribou had been preceded by the wolf control programs of the 1950's and 1960's, programs which were all but terminated in 1969 unless special situations warranted same.

Several other factors are now apparent that were not appreciated by the wildlife managers of the 1970's. The non-resident hunting of woodland caribou only took place in Saskatchewan during the years 1970 to 1973 inclusive. These 4 years were synonymous with the highest harvests of woodland caribou on record for the province (Fig. 5). In 1971, the 69 woodland caribou shot by non-residents exceeded the annual resident harvest on the species during the 1980's. The following year, no calves were recorded in the woodland caribou harvest (department files). The winter of 1971-72 exacted its toll on the provincial moose population (MacLennan 1975), and the absence of calves in the 1972 caribou harvest probably reflects the impact of that winter on the provincial woodland caribou population as well. Record low temperatures occupied Saskatchewan in early November 1971 and persisted into the first week of the regular late moose and woodland caribou seasons when 28 and 32% of the provincial harvest took place on moose and caribou, respectively.

The response of Wildlife Branch to the die-off of moose during the winter of 1971-72 was to put moose on a "draw" system. Parties that had hunted together for years now had to apply in a lottery style draw for the privilege of hunting moose. As a result, record numbers of woodland caribou hunting licences were sold and sales remained high until the system was changed for the 1977 hunting season (Fig. 5). Although woodland caribou populations had already crashed by this time, harvest levels on the species

were probably sustained at higher levels than would have ordinarily been the case before the draw system. The majority of the provincial woodland caribou harvest came out of the popular moose hunting area around Dore Lake GMZ 32 (1964-1974), GMZ 31 and 33 (1975-1983) and GMZ 66 and 69 (1984 to present). Despite changes to the zone numbers and boundaries, the overall areas for each era were almost identical to that of GMZ 32 (Fig. 2).

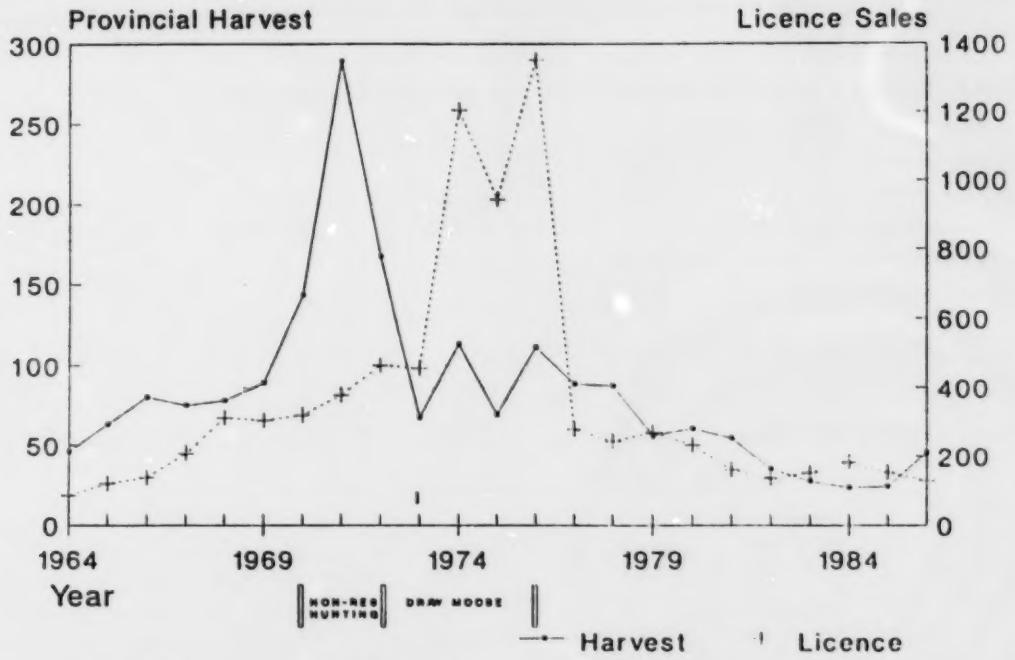


Figure 5. Harvest and sales of woodland caribou licences in relation to the provincial moose management program.

5.6 Summary of Saskatchewan Survey Data

Surveys on woodland caribou were initiated in the winter of 1985-86 in the Hanson Lake and Montreal Lake north areas, as well as along the many lakes of southern La Ronge region. During January and February, efforts were made to estimate caribou abundance via snowmobile and swamp tractor. The logistics of conducting this type of survey were brutal (Nemeth 1986) and ground surveys were abandoned. Although no animals were observed, the surveys did provide additional information on caribou distribution. The lack of results derived from ground surveys led to attempts to estimate woodland caribou numbers from aerial counts. However, the optimal time period to observe woodland caribou in open habitats was unknown. Local trappers had reported that in late winter woodland caribou tend to rest on lakes during the day, behaviour which had been also been reported in northwest Ontario (Cumming and Beange 1987). Therefore late February-early March and late April surveys were carried out initially. Populations were estimated at 40 head on both the Hanson Lake and Weyakwin (Montreal Lake north) survey blocks, and 15 woodland caribou on the Attiti Lake block, although no more than 20 woodland caribou were ever seen on any of the surveys (Rock 1988).

During the winter of 1986-87, the timing of aerial surveys was advanced to the early winter period when woodland caribou utilize frozen, open, treed muskegs. The numbers of woodland caribou observed

during these early winter surveys exceeded the projected population levels of the previous late winter surveys on each of the three study areas. On the basis of early winter surveys, population estimates exceeded 50 woodland caribou on each of the study areas (Rock 1988). Densities of 2.4/100 km² at Weyakwin, 4.7/100 km² at Hanson Lake and 5.9/100 km² at Attitti Lake on the Shield were recorded (Table 2, Fig. 6). Aerial surveys during the December-mid January period have continued through to the present.

Table 2. Summary of Saskatchewan woodland caribou aerial survey information. 1986-1991.

YEAR	SURVEY	DATE	AREA (km²)	NUMBER OBS.(PROJ.)	DENSITY (PROJ./100 km²)	STRUCTURE BULL:COW:CALF
A 1986	WEYAKWIN (CF)	DEC.3-5	2400	57 (57)	2.4	39:100:27
B 1987	ATTITI (S)	JAN.7-10	920	27 (54)	5.9	-
Z	HANSON LK (S-CF)	JAN.7-10	1080	45 (54)	5.0	33:100:33
C	SLED LAKE (CF)	JAN. 23	718	11 (27)	3.8	100:100:75
D 1988	KEY LAKE (S)	JAN.8-11	2380	63 (102)	4.3	53:100:32
1989	E.I.S. POINTS NORTH - ISLAND FALLS TRANSMISSION LINE (P-Q)					
	DECEPTION LAKE					
	BLOCK F (S)	JAN.	252	0 (30-40)	12-20	-
	BLOCK G (S)	JAN.	163	2 (24-30)	15-18	-
	ALEXANDER LAKE					
	BLOCK I (S)	JAN.	284	0 (39-41)	14-15	-
	KEEFE LAKE	(LATE)				
	BLOCK K (S-SA)	JAN.	263	2 (65-90)	25-34	-
	HUGHES LAKE					
	BLOCK M (S-SA)	FEB.	284	14 (18)	6	-
	CLOSE LAKE					
	BLOCK N (S-SA)	FEB.	263	19 (24)	9	-
1990	PRINCE ALBERT NATIONAL PARK					
R	N.W. CORNER	DEC.	651	27 ( )	4.2	5 CALVES
S	N.E. CORNER	DEC.	605	17 ( )	2.8	-
T	KAZAN LAKE (CF)	DEC 22	1481	4 (4)	0.3	33:100:0
V	MERK LAKE (CF)	DEC. 23	1253	17 (31)	1.4	45:100:11
W 1991	AIR WEAPONS RANGE/		211	7 (7)	4.1	ZERO CALVES
X	MUSKEG LAKE (CF)	JAN. 12	179	9 (9)		
Y	WHITE GULL LAKE (CF)	JAN. 17	285	15 (15)	5.3	ONE CALF

SHIELD (S) COMMERCIAL FOREST (CF) SANDSTONE (SA)

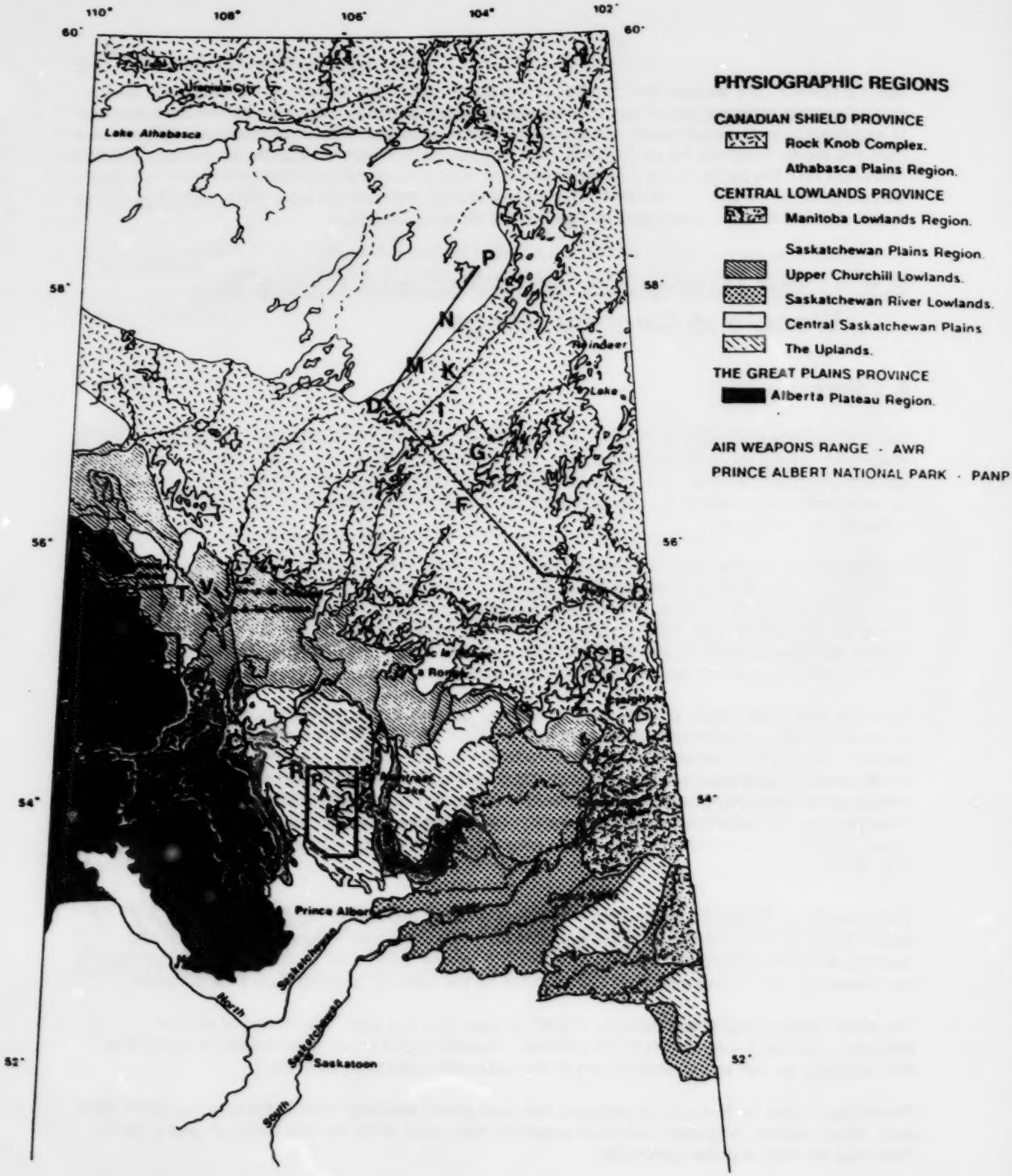


Figure 6. Woodland Caribous Survey Areas and Physiographic Regions

Surveys flown to date suggest that densities of woodland caribou are highest on the Shield and lowest in the Commercial Forest area of northwest Saskatchewan (Kazan/Merk blocks). Intermediate densities of woodland caribou were found in and adjacent to the large unhunted areas of Prince Albert National Park and the Air Weapons Range (Table 2). The Montreal Lake Plain on the northeast corner of the Park northward in to the Lac la Ronge Lowlands north and west of Montreal Lake had densities of woodland caribou between 2.4 and 2.8/100 km^2. The White Gull area, the southern most block, contained about double the density of woodland caribou found in the Montreal Lake area.

6.0 Other Resources and Resource Users in Woodland Caribou Range

6.1 Forestry

The pulp industry dominates activities in the Commercial Forest of Saskatchewan. Weyerhaeuser and its predecessors have had central Saskatchewan for their operating area since 1966; Millar Western started harvesting pulp in the fall of 1991 in the northwest part of the province. The impact of pulp operations on woodland caribou habitat is variable, dependant on current product lines i.e. proportions of softwoods to hardwoods.

The production of power poles and railroad ties, both derived from jack pine, contributed to habitat loss on woodland caribou range but these industries are diminished since the departure of the wood treatment facility in Prince Albert. Fence post production continues to take place in the Commercial Forest but is relatively small scale compared to the early 1970's when Northern Wood Preservers, Domtar and Saskatchewan Forest Products were operative around Prince Albert. Recent developments of forest specialty products include the production of jack pine shakes and an ornamental lichen trade.

Extensive sawlog operations once permeated forested Saskatchewan, but the industry is in decline due to smaller volumes of merchantable white spruce sawlogs. Presently, only the Weyerhaeuser Big River operation continues to harvest sawlogs in appreciable volumes. Smaller sawmills, harvesting smaller locally available volumes of white spruce, can still be found throughout the Commercial Forest. Small sawlog operations utilizing hardwoods are similarly found throughout forested Saskatchewan. These industries cater to specialty markets, most notably the log home industry.

6.2 Mining

The Precambrian Shield of Saskatchewan contains significant deposits of high grade uranium ore. This factor has led to the development of several uranium mines in the past 2 decades across northern Saskatchewan, including Cluff Lake, Key Lake and the several mines west of Wollaston Lake, particularly the Collins Bay site. These mines were responsible for the opening up of northern Saskatchewan.

The Shield harbours significant deposits of gold, copper, lead and zinc. The mining of gold, in particular, has had a long history in the province. Escalating gold prices often entails the re-working of old mine sites, as well as the development of new sites and exploration activities.

The mining of peat for horticultural purposes has been a long standing viable industry in the Carrot River area. More recently, proposals have been advanced that would utilize the vast tracts of peat in the Big River area for thermal power generation.

6.3 Oil and Gas Development

Exploration and the development of oil and gas deposits has been, and continues to be, a major activity in west central Saskatchewan. These developments extend northward from the North Saskatchewan River through to, and around, the Air Weapons Range.

6.4 Agricultural

The wild rice industry in Saskatchewan is centred in the La Ronge area and underwent rapid expansion during the 1980's. Many of the productive wild rice lakes occur in woodland caribou range. These lakes must be accessed by roads during the non-winter period, and many remain used year-round by other resource users.

6.5 Outfitting

An outfitting industry in Saskatchewan has been in place for decades, predicated upon sport fishing. Remote fishing lodges have made moderate use of guided moose licences (50-100 annually), but only a couple of camps along the Churchill River system were involved in the hunting of woodland caribou during the early 1970's (Wayne Runge, personal communication).

In the mid 1980's, an outfitting industry catering to big game hunters expanded to the southern Commercial Forest (Fig. 7). At the time, the black bear was the sought after species, which fit in with Wildlife Branch goals to reduce bear populations in the major moose production areas of the province. As the industry evolved, all the wildlife resources for outfitting purposes came under Saskatchewan Natural Resources review. Outfitting for black bear, which was mainly a spring operation, had evolved in to a fall operation based primarily on white-tailed deer. Limited allocations for moose were also available.

6.6 Trapping and Commercial Fishing

The registered trapline system for forested Saskatchewan was initiated in 1946, and this system of fur management remains to the present day. Northern Fur Conservation Areas (NFCA) were established primarily for the management of beaver, a species which occurred in low numbers at that time. The management of upland fur-bearing species such as marten and timber wolves falls in to the NFCA area of administration.

Commercial fishing has always taken place in northern Saskatchewan. The commercial fishery peaked in the late 1950's-early 1960's, with large volumes of fish being used to sustain a ranch mink industry concentrated in west-central Saskatchewan. In some areas of the province, the fishery remains in decline, the result of over-fishing by both anglers and the commercial fishery.

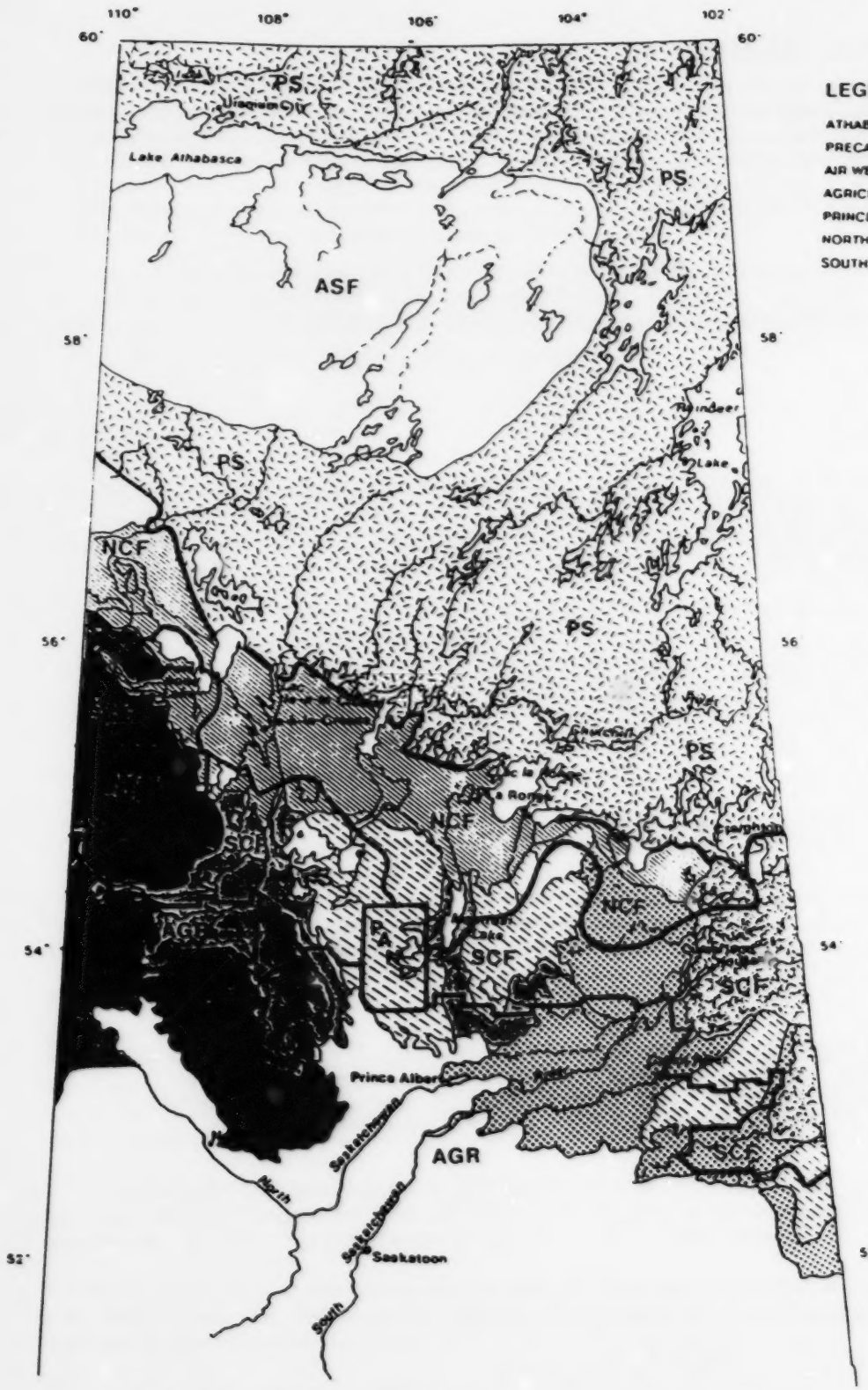


Figure 7. The Forest Regions of Saskatchewan.

6.7 Resource Users

In the far north and the northern commercial forest, (Fig. 7) aboriginal people are the primary resource users. By treaty, these people have year-round hunting and gathering rights for subsistence purposes. Limited economic opportunities are available in forestry, commercial fishing, trapping, guiding and in the wild rice and mining industries.

More intensive use is made of the southern commercial forest. More productive from both a wildlife and forestry point of view, the area sustains year-round hunting by Treaty Indians as well as thousands of days of recreational hunting by sportsmen. Further utilization of the wildlife resource takes place in outfitting, an industry controlled primarily by NFCA trappers and northern residents and, to a lesser extent, residents of southern Saskatchewan. As well, northern residents are dependent on a viable forestry sector, ranging from the highly mechanized larger bush operations to the less efficient but labour intensive smaller operations throughout the forest or proximate to local northern communities and Indian Reserves.

7.0 Future Resource Partitioning

A whole new approach will be required to doing business in the forest, an approach that will require fundamental changes in resource management philosophy. Recent court decisions, pending land entitlements, and aboriginal self government reflect a new reality for Saskatchewan, and the northern half in particular where large numbers of aboriginal people reside.

Aboriginal people and government at all levels will be co-managing the renewable resources of the future. The apportionment of these resources will have to be agreed upon to balance the requirements of subsistence living and economic opportunity against uses for recreational hunting, outfitting and intensive forest management. Fish, wildlife and forest products have already been depleted in some areas of the province, including a woodland caribou resource that continues to be hunted for subsistence purposes. The potential of the provincial moose management plan was never realized because of the non-involvement of aboriginal people; it follows that aboriginal people be involved in woodland caribou management if the species has any chance of surviving south of the Shield. Habitat and access management alone will not save the remaining stocks of woodland caribou. The co-management of woodland caribou with aboriginal people is a logical extension of the co-management process already underway between regulatory groups and resource users in the management of barren ground caribou.

The boreal forest of Saskatchewan has changed irrevocably since the turn of the century. Agricultural and forest development, and fire suppression, are here to stay. Widespread ongoing resource developments affect the use of important seasonal habitats required by wildlife, and over time the faunal mix in these areas change. In Saskatchewan, low density woodland caribou populations that were once common in the southern forests have declined coincident with increased numbers of moose and white-tailed deer. Despite concerns of aboriginal people regarding environmental damage wrought by resource development, the present situation of more moose and deer in the forest may be preferable from a subsistence point of view to the restoration of woodland caribou in select areas.

Existing long term agreements between the Province and major stake holders in the forest will have to be honoured. However these 20 year agreements are reviewed every 5 years, and their terms could be changed at these times. Policy changes have already taken place in 1991 that would allow the small independent forest operators to sign 5 year term agreements for cutting areas in the forest. It may be

that northern communities and aboriginal people will also be significant factors in the future development of the forest resources of the province.

8.0 Management Proposal

This management proposal must be tempered with the realization that there has to be a commitment for the long haul and that a short term fix is not possible. Initiatives will be long term and the benefits slow to accrue. This proposal reflects the view of wildlife managers and will be presented to affected aboriginal groups and other resource users in the near future. We hope it will stimulate discussion and the evolution of a management document acceptable to all parties.

> The objective of this proposal is to minimize the impacts of resource developments in the forest on caribou and to provide and manage extensive contiguous tracts of habitat for woodland caribou.

Boreal forest woodland caribou evolved in low numbers over huge areas. In Saskatchewan, the provision of extensive contiguous tracts of habitat for the management of this species is possible because of the unique lay-out and marked differences in productivity within the forest.

The relatively unproductive forests of Saskatchewan contribute to an over-abundance of access roads used to effectively harvest the forest resources. On a productive forest site in Saskatchewan, approximately twice the roads are required to extract the same volume of wood as on a productive forest site in British Columbia. On the predominantly thin infertile soils of the northern Saskatchewan forest, the required road network could double again over more productive sites to the south. The impacts of humans on the population ecology of woodland caribou is directly related to road access associated with resource development and extraction.

Saskatchewan contains only 4% of the commercial forest of Canada, which translates into a small industry involving few companies by Canadian standards. Only two major wood producing companies currently operate in the province. In this context, it is proposed that the companies, regulators and resource users agree to a partitioning of the forest into broad ecological units that would optimize both the production of wood fibre and wildlife. A partitioned forest that would optimize resource production is realistic in view of regional demographics and economic considerations within the forest industry.

It is apparent the provincial moose management program currently in use is not appropriate for the entire province. The objective of this program is to enhance calf production by protecting and increasing the number of prime breeding-age animals by directing hunting pressure towards the non-productive segments of the moose herd. This program has included management options to shorten or eliminate some seasons, as well as moose restoration projects emphasizing game preserves to further protect local moose populations. Despite the best intentions of the program, the Northern Commercial Forest (NCF) remains far below its potential to produce moose. During the 1980's, the highest and lowest moose kill density in GMZ 65 (roughly GMZ 29, Fig. 2) was only 0.008/km^2 and 0.0008/km^2, respectively. The provincial moose management program holds even less relevance on the Precambrian Shield where moose populations tend to be highly localized.

8.1 Strategy

- Work with resource users and agencies to develop policy to standardize access requirements associated with resource development. Placement of roads, seismic lines, power lines, and corridors require special attention to minimize impacts on caribou.

- An interim division of the Commercial Forest of Saskatchewan should be effected with resource managers to reflect the inherent differences between the northern and southern forest. Although very little is known about ecological relationships in the NCF, the area does contain the best elements of woodland caribou habitat in the province, and for the time being should be considered as one large contiguous ecological unit until a forest management plan can be developed. Major areas may have to be set aside for the protection of caribou and their habitat, as well as for the preservation of tracts of old growth forest.

- Manage the more productive Southern Commercial Forest (SCF) for a variety of wildlife species inhabiting all stages of vegetation succession. Large contiguous blocks of caribou habitat no longer exist in the SCF because significant irreversible fragmentation of caribou habitat has occurred. The SCF then would have to be managed for species best adapted to a patchy landscape mosaic.

- For the purposes of big game population management in Saskatchewan, the Pre-Cambrian Shield would be managed for barren ground caribou and woodland caribou, the NCF for woodland caribou and the SCF for moose, elk and white-tailed deer.

- Initiate dialogue with aboriginal people across the NCF about a temporary prohibition on the hunting of woodland caribou. If the variable of mortality due to hunting could be eliminated or at least documented, the effects of alterations to predator/prey systems could be assessed.

- Encourage increased harvest of wolves by trappers; passive predator control (reducing predators by reducing their food supply) should also be a consideration in any woodland caribou recovery effort. To this end more white-tailed deer should be harvested in the forest and the special protection afforded moose through the provincial moose management program abandoned in the NCF and on the Shield. In this way, moose and deer populations would be reduced thereby reducing wolf numbers as well.

- The systematic direct removal of predators such as wolves and bears by poison or shooting should be considered only as a last resort in the restoration of woodland caribou.

8.2 Implications

An integrated long term approach to resource utilization would be preferable to the current system of deferments. Once the wildlife goals and objectives for an area are known, the integration process would allow for unimpeded management of the forest resources. It is not realistic to attempt to manage for all species at the same time on the same land base.

The productive (forestry perspective) land base is about 20% greater in the SCF than the NCF, due primarily to higher proportions of upland forest found in SCF. Although the SCF does contain large tracts of softwood forest, it is the Mixed Wood Forest that provides the resource manager with more management options than can be found in the less productive softwood forests on the Churchill River and Manitoba-Saskatchewan Lowlands to the north (NCF).

The variety of potential wood products in the SCF, each with their own forestry prescriptions, would be capable of producing considerable biomass as well as supporting a broad complement of wildlife. The forest would be managed to apportion the age classes of most timber stands from the early seral stages through to maturity, thereby favouring species such as moose, elk and white-tailed deer. Although some old growth (over-mature) forest would be retained, habitat fragmentation would increase, making it increasingly difficult to sustain those species requiring large contiguous tracts of habitat to fulfil their life requisites. The relict herds of woodland caribou there now would ultimately disappear.

The management of the NCF aimed at preserving late successional forest habitat, offers the best chance of preserving the larger more viable stocks of woodland caribou still remaining in the province. This predominantly softwood forested area affords less forest productivity and wildlife diversity and is further away from the major population centres of the province. Late successional flora and fauna will be favoured by apportioning age classes of timber to include over-mature as well as the younger forest succession stands. This approach will lengthen the forest cutting rotation but would also facilitate increasing clear cut sizes from the 40 ha. maximum now in effect for softwood stands.

The NCF managed as a unit, would lessen habitat fragmentation and force the large forest harvesting companies and the smaller forest operations to develop complementary timber management strategies. Fewer roads would be required over a shortened time frame. Standardized access procedures would ensure that one resource is not developed to the long term detriment of another.

An increased take of wolves on Northern Fur Conservation Area traplines may not be realistic in view of the current state of the international fur trade. There is little incentive to trap because of the low prices for wild fur that plague the industry at this time. The restoration or maintenance of existing woodland caribou populations that would entail a lowering of wolf populations by reducing the numbers of white-tailed deer and moose in the NCF may be at cross purposes with long term subsistence opportunities for the aboriginal people of that area.

Systematic predator control would have to be extensive and long term. Successes would be short term and regional in context. Population recovery of woodland caribou would be slow. The costs of effecting such a program would be prohibitive and the effort contentious at the outset. Predator control that would take place before the actual status of predator/prey relationships could be determined (data interpretation is a real problem) would not sit well with environmental advocacy groups, particularly if the perceived intent of such a program was the restoration of sport hunting in the province. It may be that the current unregulated harvest represents the available surplus over and above that taken by wolves. In the absence of predator control, the continued exploitation of the woodland caribou resource must remain low.

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